Energy management – a continuous process

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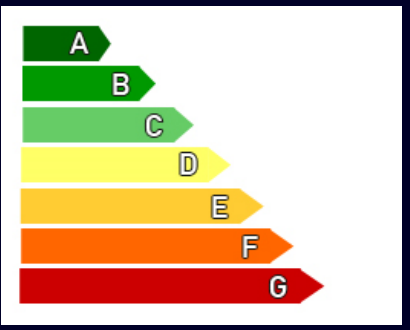
Energy management – a continuous process

Acquired energy data

Acquisition of the measurement values

Checking and evaluation of the measures



Continuous improvement process

Analysis of the data

Planning of energy efficiency measures

Realization of the measures

Improvement according to ISO 50001 with Plan – Do – Check – Act (PDCA)

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Energy Audit – A Holistic approach.

What is Energy Audit

- Inspection survey and analysis of energy flows
- Investigating how energy is used, and where it is wasted
- Finding measures to reduce energy losses
- Cost-benefit analysis to highlighting which energy efficiency measures are best to implement

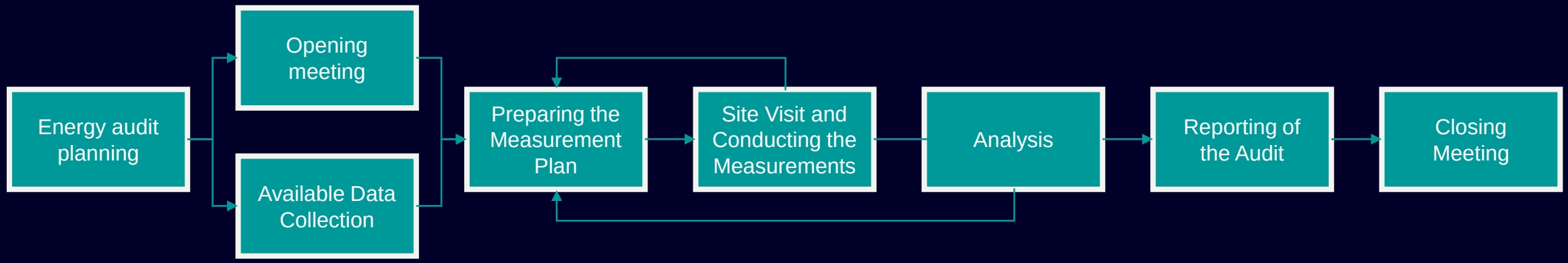
Areas Analyzed

- Production Areas: Production Machines, Fans, Pumps
- Utilities: Boilers, Pressurized Air, Water Treatment and Wastewater Treatment Units, Cooling Units, Climatization (HVAC), Evaluation of Automation Systems
- Electrical Systems: Lighting Systems, Electrical Motors, Evaluation of Electrical System
- Cogeneration Systems

Steps of the ISO 50002 Compatible Energy Audit Diagram

Audit Methodology based on ISO 50002

Steps of the ISO 50002 Compatible Energy Audit Diagram



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Some Project Examples

No	Measures	Relevant Facility/Unit	Energy Type	Savings Amount			Investment Cost	Payback Period	Implementation Plan*
				Amount	Original Unit	€/Year	€	Year	Term
1	Energy Savings by Means of Using of Atlas Copco 315 VSD Air Compressor Used in Power Plant Instead of Low Efficient Ingersol Rand Air Compressors	Compressed Air	Electricity	1.868.100	kWh	112.086	480.000	4,3	LT
2	Savings by Means of Reduction of Idle Time of Air Compressors	Cooling System	Electricity	4.173.942	kWh	250.437	150.000	0,6	ST
3	Energy Saving by Applying Automation System for Bloom and Slab Caster Primary Cooling Booster Pumps	Cooling System	Electricity	1.966.677	kWh	118.001	40.000	0,3	ST
4	Savings by Means of Automatic Control of air Compressors Cooling Water	Production Units	Electricity	8.674.545	kWh	520.473	1.000.000	1,9	ST
5	Natural Gas Savings by Means of Heating Pigs Entering Furnace with Slack Gas from Furnace due to Preheating	Production Units	Natural Gas	3.779.588	Sm3	929.779	9.000.000	9,7	NF
6	Energy Savings by Using Efficient Lamp in Lighting Fixures	Lighting System	Electricity	3.928.320	kWh	235.699	1.190.400	5,0	LT
7	Energy Savings by Means of Replacing PC02 Furnace Cooling Water Pumps with efficient Types	General	Electricity	3.056.435	kWh	152.822	399.008	2,6	MT
8	Energy Savings by Means of Operation of Throttling on Reko Fan with Frequency Driver instead of Throttle	Meltshop	Electricity	43.595.120	kWh	2.179.756	13.000.000	6,0	LT

*ST: Short Term (0-2 years), MT: Medium Term (2-4 years), LT: Long Term (4-6 years)

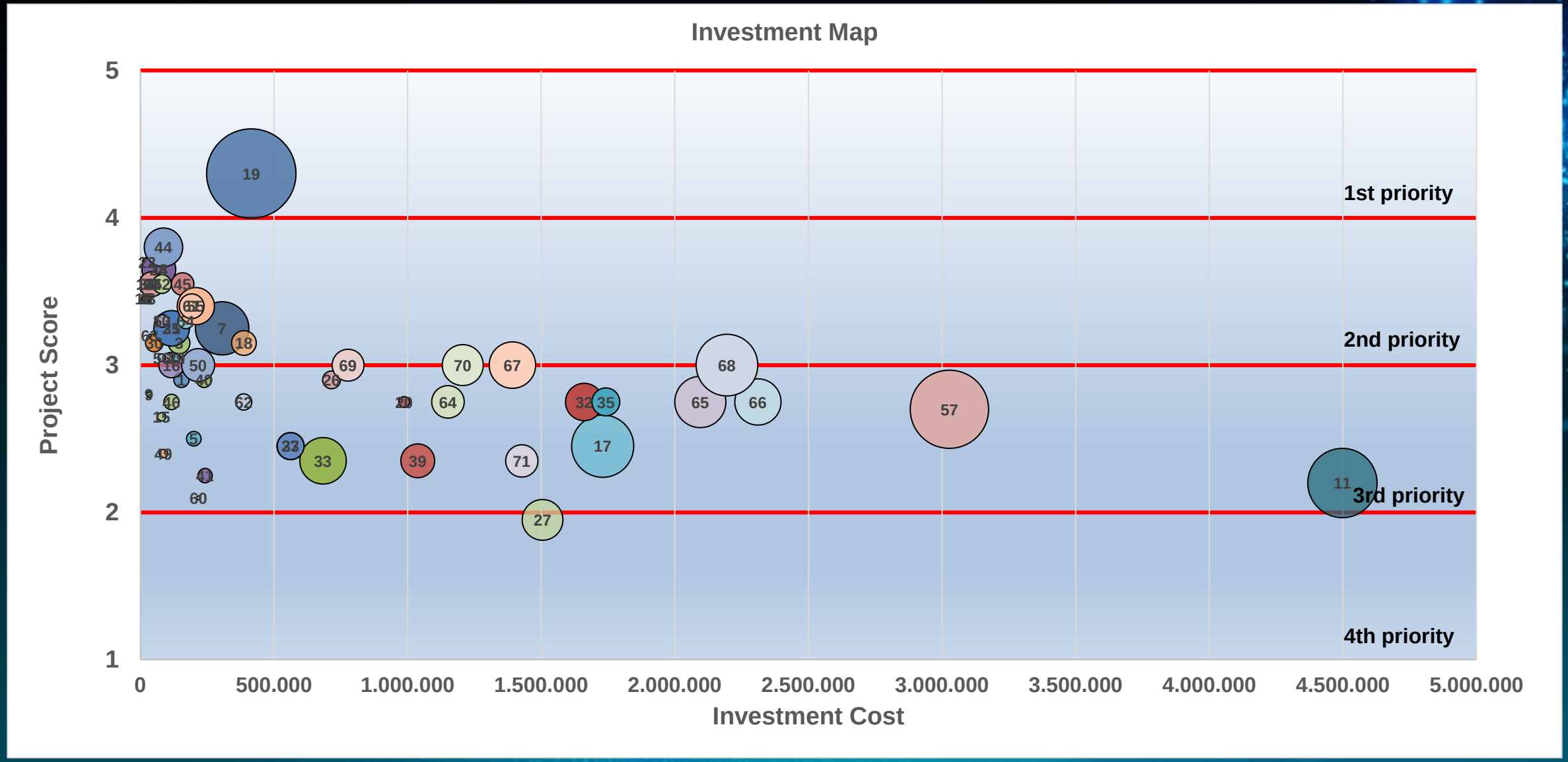
Project Scoring and Prioritization

Criteria (c)	Acronym	Scale	Weight
Implementation	I	1,0 – 5,0	25%
Profit	P	1,0 – 5,0	25%
Cost	C	1,0 – 5,0	15%
Saving	S	1,0 – 5,0	20%
Risk	R	1,0 – 5,0	15%

$$\text{Overall Score}_i = \sum_{c=1}^{6} (\text{Note}_c \cdot \text{Weight}_c)$$

Implementation (I)		
5	Very easy	Requires no extra manning, no training, and no technical uncertainties. Implementation can be done within less than 1 month
4	Easy	Requires no extra manning, no training. There are some technical uncertainties to be investigated. Implementation can be done within 1 to 3 months
3	Moderate	Requires training of the operators and there are technical uncertainties to be investigated which is time demanding. Implementation can be done within 3 to 12 months
2	Difficult	Requires significant training and there are technical uncertainties to be investigated which may require external consultancy. Extra manning may be required during implementation phase. Implementation can be done within 1 to 2 years
1	Very Difficult	Requires extra manning, extensive training. There are a lot of technical uncertainties. Implementation can be done more than 2 years
Profit (P)		
5	Very Profitable	Payback period less than 3 months
4	Profitable	Payback period from 3 months to 12 months
3	Moderate	Payback period from 1 year to 2 years
2	Low Profitability	Payback period from 2 years to 4 years
1	Not Profitable	Payback period more than 4 years
Cost (C)		
5	Very Low	Cost of implementation less than 5.000 Euro
4	Low	Cost of implementation from 5.000 Euro to 20.000 Euro
3	Moderate	Cost of implementation from 20.000 Euro to 100.000 Euro
2	High	Cost of implementation 100.000 Euro to 500.000 Euro
1	Very High	Cost of implementation greater than 500.000 Euro
Saving (S)		
5	Very High	Reduction of consumption greater than 2,5%
4	High	Reduction of consumption from 1,0% to 2,5%
3	Moderate	Reduction of consumption from 0,3% to 1,0%
2	Low	Reduction of consumption from 0,1% to 0,3%
1	Very Low	Reduction of consumption less than 0,1%
Risk (R)		
5	No Risk	No risks associated with product quality, health and safety or any other area.
4	Low Risk	Low risk associated with product quality, health and safety or any other area. Risk can be eliminated by simple precautions.
3	Moderate Risk	Moderate risk associated with product quality, health and safety or any other area. Risk can be eliminated by additional supervision.
2	High Risk	High risk associated with product quality, health and safety or any other area. Risk can only be reduced by additional supervision but cannot be fully eliminated
1	Very High Risk	Very high risks associated with product quality, health and safety or other. Risk cannot be reduced to tolerable level even with additional supervision.

Projects Prioritization and Road Map



Energy Efficiency…

… has the shortest payback period among all energy investments

Solar PV 5 yr. ROI
Wind 7 yr. ROI
Energy Efficiency < 2 yr. ROI

…the cleanest, cheapest and most domestic energy source

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